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EXAMINER

JOLLEY, KIRSTEN

ART UNIT

PAPER NUMBER

1762

DATE MAILED: 09/15/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/085,498

Applicant(s)

YOO, WOO SIK

Examiner

Kirsten Crockford Jolley

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) 21-31 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Applicant's election of Group I, claims 1-20, in Paper No. 7 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Specification

2. The abstract of the disclosure is objected to because it is directed to a non-elected invention. Correction is required. See MPEP § 608.01(b).

3. The following title is suggested: --Method of Forming an Oxide Layer--, since the apparatus claims are not being prosecuted.

4. It is noted that the limitations of claim 3 ("said thickness of said second processed layer is between about 1,000 Å and 1 µm") and claim 14 (wherein said thickness of said SiO₂ layer is between about 1,000 Å and 1 µm") are not present in the specification. The specification teaches thickness ranges of 1000 Å to 5000 Å in paragraphs [0047] and [0050], and 0.5 µm to 20 µm in paragraph [0050], however the specification does not appear to disclose the claimed range 1,000 Å to 1 µm. The claimed range is not new matter because it is present in the originally filed claims, however the Examiner suggests that Applicant add this range into the specification so that the specification properly discloses all of the claimed limitations.

Claim Objections

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5. Claim 9 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 9 does not appear to further limit claim 7 because claim 7 requires that said coating material which is applied to form said first layer is spin-on glass.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 13 and 14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 13 is vague and indefinite because it is not clear whether the phrase "said layer of SiO₂" in line 2 refers to the layer of SiO₂ formed at the end of first heating step (b) of claim 12 or the hardened layer of SiO₂ formed at the end of second heating step (c). The specification teaches at paragraphs [0050] to [0052] and in Figure 4 that a second layer of SOG can be applied over the first layer of SiO₂ after either heating step (a) or heating step (b), therefore it is not clear from a reading of the specification to which layer of SiO₂ from claim 12 (the outgassed layer or the hardened layer) claim 13 refers. For the purpose of examination, the Examiner has broadly interpreted claim 13 as reading on applying a second layer of SOG on top of *either* an outgassed SiO₂ layer produced by heating step (b) *or* a hardened SiO₂ layer produced by heating step (c).

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Claim 14 is vague and indefinite because it is not clear whether the phrase "said SiO₂ layer" in line 1 refers to the layer of SiO₂ formed at the end of first heating step (b) of claim 12 or the hardened layer of SiO₂ formed at the end of second heating step (c). Because the specification does not disclose that either layer is formed to a thickness of 1,000 Angstroms to 1 μm (see section 4 above) and because the specification states in paragraph [0051] that shrinkage can occur during the second heat treatment step, it is not clear which SiO₂ layer is being referred to (the outgassed layer or the hardened layer) or how one skilled in the art would know if they were infringing the claim. For the purpose of examination, the Examiner has broadly interpreted claim 14 as reading on applying *either* an outgassed SiO₂ layer produced by heating step (b) *or* a hardened SiO₂ layer produced by heating step (c) to the claimed thickness.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 1, 5-9, 12-13, and 16-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Yen (US 5,174,043).

With respect to claims 1, 7, and 9, Yen discloses a method for forming an oxide layer comprising the steps of: applying a spin-on-glass (SOG) coating material to a substrate to form a first layer (col. 3, lines 21-24); heating said first layer to a first temperature for a first time duration to cause said first layer of SOG to outgas (col. 3, lines 27-30); and heating said layer to

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a second process temperature for a second time duration to cause the SiO₂ layer to harden (col. 3, lines 36-43).

With respect to claims 5-6 and 16-17, Yen teaches that the first temperature is in the range of 250-350 °C and the second temperature is in the range of 350-500 °C (col. 4, lines 28-31 and lines 60-65). With respect to claims 8 and 12, it is noted that Yen does not specifically teach that a layer of SiO₂ is formed after the first heating step. It is noted that the specification states in paragraph [0049] that the first heat treatment is performed *until the solvents are outgassed*; likewise, Yen states that the disclosed temperature range is sufficient to remove trapped gases in the SOG layer. It is the Examiner's position that the SOG coating of Yen would necessarily outgas to form a layer of SiO₂ as claimed because Yen teaches use of the same coating materials as those disclosed in the specification, as well as heating to temperatures completely within the claimed temperature range of the first heat treatment step, therefore a similar product must inherently be formed. Further, it is noted that Yen teaches that curing and crosslinking may occur at a minimum temperature of 350 °C, and that the outgassing heat treatment may likewise occur at a maximum temperature of 350 °C. Therefore if the first outgassing heat treatment occurs at a temperature of 350 °C, as taught by Yen, then some curing and crosslinking must inherently occur to form SiO₂ as a result of the first heat treatment.

As to claim 13, Yen discloses that additional coatings of the SOG material are applied and exposed to the first heat treatment until the desired SOG layer is formed, prior to the high temperature curing step/second heating treatment (col. 3, lines 33-35). This sequence meets the limitation of claim 13 as discussed above with respect to the 35 USC 112, 2nd paragraph rejection of claim 13.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 3-4 and 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yen (US 5,174,043).

As to claims 3 and 14, Yen lacks a teaching of the thickness of its silica layer. Yen teaches that the thickness of the spin-on-glass coating is preferably from 0.08 to 0.2 μm (col. 3, lines 6-9). Overlapping ranges are *prima facie* evidence of obviousness. It would have been obvious to one having ordinary skill in the art to have selected the portion of Yen's thickness range that corresponds to the claimed range. *In re Malagari*, 184 USPQ 549 (CCPA 1974).

As to claims 4 and 15, Yen does not disclose that the first and second time duration of first and second heat treatments are both about 5 to about 10 minutes. However, it is noted that Yen teaches the time depends upon the type of spin-on-glass used and the thickness of the layer or layers (col. 5, lines 14-29). The Examiner also notes that times for heating are dependent upon the exact temperature used as well. It is well settled that determination of optimum values of cause effective variables such as these process parameters is within the skill of one practicing in the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980).

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12. Claims 2, 11, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yen (US 5,174,043) as applied to claims 1, 5-9, 12-13, and 16-17 above, and further in view of Ouellet (US 5,470,798).

With respect to claims 2, 11, and 20, Yen lacks a teaching of performing each of claimed steps (a), (b), and (c) and then repeating each of steps (a), (b), and (c) to apply and heat treat a second SOG layer on top of the hardened SiO₂ layer. Ouellet is cited for its similar teachings of applying a SOG coating material to a substrate and subjecting the coating layer to a similar curing process in a vacuum atmosphere whereby the coating polymerizes and causes release of water, solvent, and alcohol (col. 1, lines 16-18 and col. 8, lines 13-14), similar to Yen's process. Ouellet teaches that the coating and curing steps are repeated up to three or more times until a sufficient film thickness has been achieved (see Abstract, col. 1, lines 60-64, and col. 6, lines 35-42). It is the Examiner's position that it would have been obvious to one having ordinary skill in the art, upon seeing the prior art of Ouellet, to have repeated each of the coating, first heat treatment, and second heat treatment steps of Yen in order to achieve a desired film thickness because Ouellet teaches successful results of achieving a thicker coating by coating and curing a second (and third, etc.) layer after the first layer has already been cured and one would expect similar successful results in the process of Yen because the references are similarly related in the field of coating and curing SOG coatings. The test of obviousness is not express suggestion of the claimed invention in any or all references but rather what the references taken collectively would suggest to those of ordinary skill in the art presumed to be familiar with them. *In re Rosselet*, 347 F.2d 847, 146 USPQ 183 (CCPA 1965); *In re Hedges*, 783 F.2d 1038.

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As to claim 19, Yen lacks a teaching of applying its SOG coating by dipping. Ouellet teaches that the SOG coating material can be applied by any of a number of methods in its invention such as spin coating, immersion, or spraying (col. 8, lines 18-21). It would have been obvious to one having ordinary skill in the art, upon seeing the prior art of Ouellet, to have coated the SOG coating material in the process of Yen by immersion instead of spin coating with the expectation of successful results because Ouellet teaches the equivalence of both coating techniques in a SOG coating process. Again, it is noted that the test of obviousness is not express suggestion of the claimed invention in any or all references but rather what the references taken collectively would suggest to those of ordinary skill in the art presumed to be familiar with them. *In re Rosselet*, 347 F.2d 847, 146 USPQ 183 (CCPA 1965); *In re Hedges*, 783 F.2d 1038.

13. Claims 1, 3-10, 12, and 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyashita et al. (US 5,380,608) in view of Yen (US 5,174,043).

Miyashita et al. discloses a process for making a photomask, whereby Miyashita et al. teaches use of a quartz substrate 50 on which is formed an etching stopping layer 51 followed by transparent film 52 (see Figure 2a and col. 8, lines 37-57). Miyashita et al. teaches at col. 8, lines 49-53, that transparent film 52 is preferably a film of high-purity SiO₂ and may be provided by a coating procedure such as spin-on-glass coating where siloxane is spin-coated and heated to form a SiO₂ film. One skilled in the art would have been motivated to look to the prior art for more information and a detailed method of applying SOG coatings to a substrate and heating the coating to form a SiO₂ layer. Yen discloses a method of applying a SOG coating by spin coating

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and conducting first and second heat treatments to convert the SOG coating to a SiO₂ film having a planar surface. It would have been obvious to one having ordinary skill in the art to have used the process of Yen to form transparent SiO₂ film 52 in the process of Miyashita et al. with the expectation of successful results because Miyashita et al. is silent with regard to the specifics of a SOG process to be used in its invention to form transparent film 52 and Yen teaches an exemplary SOG coating and curing process. Additionally, one having ordinary skill in the art would have been motivated to use the process of Yen to apply and cure its SOG coating because Yen teaches producing a cured SOG/SiO₂ film having improved planarity.

With respect to claims 1, 5-9, 12, and 16-17, Yen is applied for the reasons discussed in section 9 above.

With respect to claims 3-4 and 14-15, Yen is applied for the reasons discussed in section 11 above.

With respect to claims 10 and 18, the process of Miyashita et al. uses a quartz substrate. It is noted that claims 1 and 12 do not require that the SOG coating is applied directly to the substrate surface.

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Livesay et al. (US 6,132,814) is cited for its teachings in its Background section (col. 1) of applying SOG liquid coatings and performing first and second heat treatments to outgas and cure the SOG coating layer, respectively.

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Yang (US 5,500,243) is cited for its teachings (col. 2) of applying a SOG coating and performing first and second heat treatments to outgas and cure the SOG coating layer, respectively, and its use on magnetic thin film heads.

Elkins et al. (US 4,676,867) is similarly cited for its teachings (col. 3, line 19 to col. 4, line 45) of applying a SOG coating and heat treating the coating.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kirsten Jolley whose telephone number is 703-306-5461. The examiner can normally be reached on Monday to Thursday and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on 703-308-2333. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1193.


Kirsten C. Jolley
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kcj